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My name's Dan Askin, president and technical director, founder of ESCA Tech for 28 years now. So we suspect we'll be in business next week, too.

Reducing blood leads basically comes down to two issues: limiting dose, dose comes by three routes, inhalation, ingestion, and skin absorption. The other element is maximizing excretion, because once you take the lead in, now you have to get rid of it. So we want to limit the absorption by reducing the dose, how much actually enters the body? As we'll discuss a little later, after lead is taken into the body, there is some efficiency related to how much of that is actually absorbed, and there's basically four elements to controlling blood leads or implementing a blood lead reduction program: controlling airborne dust, personal protective equipment, housekeeping, and personal hygiene. And what has become increasingly apparent is that the key to this is personal hygiene.

Let's start with talking about the dose. The World Health Organization actually publishes a recommendation on the maximum tolerable dose for lead. It's called the provisional tolerable weekly intake, and for lead, that's 25 mcg per kg of body weight. So for 100kg person, that's 2.5 mg a week is considered the tolerable dose. And if we reduce that to a daily level, let's put it in perspective of 100mg aspirin, everyone's familiar with how big that is, that tolerable weekly dose reduces to 350 mcg in a 24 hour period. Now, if you take that aspirin, and you cut it up into 300 pieces and throw 299 of them away, what you have left is 350 mcg. So for a 50kg person, that tolerable dose is half that amount, and for a child weighing 20kg, you're talking 70 mcg. Not a lot of material. In battery recycling, we also deal with arsenic and cadmium. They also have maximum tolerable weekly intake assigned to them. Arsenic is 15mcg per week, and for that 100kg person, that's 215mcg a day. Cadmium, 7mcg per kg per week. Now the same factors that apply to lead in my discussion today will also apply to cadmium. Arsenic, while the same measures are usually functional, arsenic is the strangest chemical element on the table. Arsenic is both a metal and a non-metal, and arsenic has one very curious property, is that solid arsenic will evaporate and form a gas without ever going through a liquid state. But that's primarily an issue when you have molten material.

So excretion. If we look at the tolerable weekly impact, or tolerable daily dose, and the dose of lead is more than that level, then the blood lead's going to go up, and the additional lead will be placed into storage. If it's less than that tolerable dose, then lead can come out of storage, back into the blood where it has the opportunity to be excreted. And the best way to bring down blood leads is to prevent them going up in the first place, because it takes 2-3 times as long for a blood lead to go down as it took it to go up. So, body doesn't think much of lead, so it finds lots of ways to get rid of it. Every excretion path available to the body removes lead from the body: urine, feces, sweat, saliva, mucus, shedding of dead skin cells, hair, fingernails, and toenails, all excrete lead. So how does lead get in the body in the first place? Well, you can inhale it, you can eat it, or it can be absorbed through the skin. On the simplest level, you can compare the efficiency of these three routes by comparing their surface areas. Now, those surface areas are, in fact, an oversimplification, because those calculations assume that the lungs are a smooth surface, and no dimples, the skin is a smooth surface, when in fact, the skin, if you look at it under magnification, looks like puff pastry, and of course, if you're going to track your blood leads and find out if you're having any success in controlling them, you have to measure them. So how often do you measure blood lead levels? We generally use a tiered approach, depending on how high an individual's blood lead is the more frequently we check it. But even in the most rigorous programs, we never sample more than once a month, unless it's a follow-up confirmation test, and one thing that a lot of people overlook is how exceptionally clean the sample room and the sample supplies, and the skin at the stick site need to be to get an accurate sample. So inhalation, ingestion, and skin absorption, all contribute to the body burden and the dose.

So let's talk about the lungs. What are the lungs designed to do? They're designed to take material out of the air and put it into the bloodstream. They were designed to do that effectively. They do a very good job of that with oxygen, they do not as quite an efficient job with lead, but they do a pretty good job at putting lead from the air into the bloodstream. Ingestion: lead is absorbed very efficiently on an empty stomach, because there is no competition between the lead and the food for absorption into the bloodstream, and when I talked about the digestion system having 10 square meters of surface area, what I did not take into account is that very textured surface. This diagram (on slide) shows the blood vessels close to the intestinal walls, and as you can see, there's a tremendous amount of surface area.

Skin absorption: So lead that's on the skin can be both ingested and inhaled. If I wipe my nose, and there's lead on my fingers, I will inhale some, I'll transfer some. When I grab my respirator and pull it off my face, the, what I'm basically doing at the instant I break the seal of the mask to the face is I'm creating a vacuum, and that will basically vacuum clean my fingers. And of course, when I do this, I get most of my daily dose of lead in short order. Water soluble lead does in fact pass through the skin. If you take a look at the structure of skin at the top, you have dead, dehydrated, very high surface area skin cells, and they're porous, and they're layered, and it has a tremendous amount of holding capacity for lead. Below that, you get into the living tissues, the sweat ducts and hair follicles provide a pathway for lead to enter the body. The difference is that insoluble lead does not migrate through the skin, soluble forms of lead do migrate through the skin, and the catch-all is that sweat is acidic, and to some extent can dissolve insoluble forms of lead. So efficiency of the inhalation route is size dependent. Particles between 3/10 of a micron and 10 microns are efficiently deposited all the way down in the lower recesses of the lungs where they will sit until the moisture in the lung dissolves the particles, and it moves through the cell walls into the bloodstream. It takes a day and a half to three days for that particle to finish its route into the blood. 10 micron particles, if they're large, they're generally removed by nasal hairs and the cilia in the throat, the cilia are those little fibers that line the throat, and is one of the body's mechanisms to clear inhaled dust and dirt out, but what happens is a lot of that winds up being swallowed, now it's in the stomach, where it has a new opportunity to be absorbed. For those of you familiar with HEPA filters, you may have noticed that they're rated for efficiency at 0.3 microns -- 0.3 microns is a very interesting particle size. When it comes to the lungs, it is the particle size that the lungs are the most efficient at removing from the air. When you talk about fabric filters, whether they're bag filters or panel filters, or HEPA filters, 0.3 microns is the particle size that fabric filters are least efficient on. So the best filtration technology is limited by the fact that it's weakest point is the lung's strongest point. We quite frequently see blood lead levels higher in, when there is exposure to molten lead, and looking at that over the years, what we've basically concluded is that, while the really small particles remain suspended as they get inhaled in, and come back out, immediately they collide with the wet surfaces in the lungs and the throat, and wind up being swallowed, and they also, the lungs happen to be exceptionally good at removing those size particles. We have gone back to the point that we don't let anybody near molten lead anymore without a respirator because we see so many higher blood leads in that area.

So if we're going to reduce inhaled lead, we need to have an approach on how to start. And the first place is to go through the operation and identify every source of lead emissions. And then we want to rank them as far as their contribution to the total exposure, we take the biggest sources, we enclose, we eliminate or we ventilate, as Russell this morning gave us some very good pictures of, ventilation we're talking about capture efficiency, the percentage of the dust that is actually generated that we put into the duct work so that we can filter it, and of course, the filter efficiency, how much of it we remove after we capture it, and last is controlling fugitive sources. So where to start? You start with the visible dust, and you start with any fresh lead fume, molten lead. That's the place you start. After you take care of your visible emissions, then you can worry about the ones that you can't see. So for each source, we're going to identify and rank the dust quantity duration and timing. Dust doesn't magically appear. Dust always has an origin. It has an origin in space. It can be defined by coordinates. You can precisely identify the originating source of an emission. The second characteristic that all dust sources have is there is a time element associated with them. Certain emissions are intermittent, certain are ongoing, and you have to take that timing factor into account. The second, the third thing, is with respect to timing. Once you've identified where the dust originates in time and space, and you have identified where it originates in respect to time, you have basically a small window on which you can capture it. During the first 10 milliseconds, that dust particles will encompass an area about this big. After a second, it's about this big, after two seconds, it can fill the

room. So when you're doing your source identification, you need to identify location and timing. Next, where does it go? Most dusts do have a destination. It could be the neighbors, it could be right back into a workers' face, but you can have some idea of where it actually goes. Estimate the cost to control. Takes a lot of brainstorming, but there are cheaper ways to do things than others, but now when we're ranking, we're going to rank the cost to control each of those sources. If I can eliminate 100kg of lead emissions for $2,000, obviously that project is going to get done before the one that's going to cost me $20,000 to eliminate 10kg of emissions. So it's, like everything else in the plan, economics rule. There's still a lot of outdoor storage piles, Russell covered sweeping, but one of the more successful methods they've employed in Australia in outdoor storage piles is to actually spray the piles with papier-mâché. As you can see from the recipe there, that is quite economical to make, waste paper, 50kg, 15,000 L of water, and then they drive around with a tank truck around the yard, and they spray the storage piles with papier-mâché, as far as material costs, we can afford that. They also make dust suppressants, for examples, dust-ex, which is made by the timber and paper industry, it's the ligno-sulfanate which is the glue which holds trees and fibers together, it's also a very inexpensive commodity. And in green screens, between the plant and the neighbors, we need to have vegetation that will capture the dust that leaves the site before it gets into the town. If you're planting trees, you're planting saw grass, whatever local tall ventilation is that grows well in that soil, dust leaving the site, this vegetation can actually function as a filter and remove lead from the air that's leaving the site.

So now onto housekeeping. I know when I was growing up, I've always heard the phrase "Cleanliness is next to godliness," but everything needs to be clean. We're talking about 1/300th of an aspirin that can be picked up by a worker all day, so every time I touch something, I can basically pick up a full 24-hour dose on my fingers. We ran an experiment in a firing range once, we wanted to find out how much lead was generated by firing a single round out of a bullet. So we went onto the range, we had a 9mm pistol, lead slug, lead primer, three people fired, we recovered all the lead on the hand they used to fire, we recovered 50mcg of lead deposited on one hand from firing one round from a 9mm berretta. Now if you think of that, the 350 mcg per day total dose, that's 7 rounds, well nobody cleans their hands like a cat, but that's how easy it is to pick up 350 mcg of lead where lead's present.

Central vacuum system. There is no substitute in a lead processing operation for a central vacuum system. On the right, the hardware, we have the red light some place. There is the dust hopper, the bag house, this is the inlet over here, comes out, it comes through a balancing damper, into the vacuum producer, through the silencer, and out the stack. Now obviously, I didn't take this picture at a lead plant, because that stack is a little short, but, and then this is a basic diagram from an assembly operation in a battery manufacturing plant.

Personal protective equipment. I am *not* going to go into this in the level of detail that you are promised by the other speakers this morning. But I do want to talk about respiratory protection. On the top, we have a negative pressure, full face respirator, and on the bottom, we have powered air purifying respirators, which maintain a positive pressure inside the enclosure. This is what I prefer to wear when I'm working inside a bag house. This is what I prefer to work when I'm running around the plant and don't have 10 kilos of dust falling on me every two minutes. Regardless of whether it's a negative pressure or a positive pressure respirator, in the U.S., those filters for lead are designated as P100s, they are tested to HEPA standards, and they are color coded purple, and they will remove all of the dust, all of the acidness, will not remove acid gases. I find it extremely important to recommend that the doctor find out if a person is physically able to do the job you have in mind while wearing a respirator. Negative pressure respirators leak. They leak at the face seal. When I worked in a smelter in the late 70s, respirators came in one size: medium. I do not fit in a medium respirator. I'm kinda long in the face, and years later, I actually had a chance to measure the amount of leakage on the face seal with that respirator that I wore in the smelter. I got 2% filtered air and 98% leakage around the face seal, which is one of the reasons I became interested in blood lead reduction programs. Negative pressure respirators have to be sealed to the face, no facial hair. A day's growth, a little stubble is enough to hold the mask away from the face just far enough that none of the air goes through the filters. And fit testing. You need to find out that the person actually knows how to put on the right size, have the right size face piece, and know how to put it on correctly, so first time, every time, it's sealed.

But when it's all said and done and we've dealt with the airborne, I don't care if there is no airborne exposure in the plant. Personal hygiene can defeat any blood lead control program. We encounter blood lead problems in locations where there is no airborne lead, and people are only handling finished castings, because their personal hygiene is so bad that they manage to ingest too much lead every day. So their leads are high, personal hygiene will improve your blood leads, and if air leads are low, personal hygiene will reduce the blood leads even further. Simple wash station, we've got water, we've got soap, we've got towels, and we have a mirror. We want people to wash their face, and also, quite frequently, this is the, in the washroom, people often put their respirators on again before they return to the plant, it's always helpful to have a mirror to look in when your respirator's on, because it gives you a couple more clues and checks to make sure that you put it on correctly. I want to concern with handwashing, because everybody wears gloves. Okay, then tell me how you're going to get your gloves off your hands without getting the lead on the outside of the gloves on your hands. Well, we've actually evolved that procedure, which I have on these four pictures (on slides). I take the first glove off with the other glove, so I've got one glove handled cleanly, but before I finish taking the first glove off completely, I use the other glove to get started on the second glove, and when I actually remove them, I handle the gloves only by the inside and then set the gloves down and pick them up, grasping them from the inside. It's a little more difficult with vinyl and latex gloves, but you can basically, those tend to be single use, you can hook underneath them and roll them off and actually minimize the amount of dust you pick up on your hands from taking your dirty gloves off. Wash station. Let's see, we've got hot and cold running water, we have fingernail brushes, and we have towels, and the most common mistake I see is sinks that are too small. I want the person to wash all the way up his arms, I want him to wash his face, I want him to wash his neck, I want him to wash his hands, and if I have a little bathroom sink, I can't get my elbows in under the water, so I can't get the washing done properly. So a couple slides in sequence here on washing, lots of water, wash thoroughly, I want to go back here a second, using the fingernail brush, I'm using the inside of my palm to work soap underneath my fingernails, I'm going to wash each finger individually, I'm going to make sure that I spread the soap over all of the surfaces, and then I'm going to wash the arms and my face and neck, and the procedure I basically use is when I walk into the sink, I wash my hands. I consider that a pre-wash, I rinse them, and then I get serious, and then I wash my hands again, my arms, and my face and neck, and spend a fair amount of time on the subject. Lead is an interesting, interesting substance. I think everybody knew lead's heavy, well, that means it's difficult to float in water. It's sticky. Lead is used to make cements. That's how you actually glue a picture tube together: the side glass and the front glass is with lead silicate, cement. Lead's difficult to wet. You take water, and you spray a pile of lead, what you find is the water has a tendency to bounce right off the pile. Lead forms soap scum. For the translators who might not have counted the term "scum" before, that's bathtub ring, it's the precipitate that you get from hard water and soap. Lead, being very chemically similar to calcium, forms soap scum with many, many soaps and detergents, and now what you've done is, instead of washing the lead off your hand, you've actually glued the lead to your skin. Lead smears, it's not abrasive, it holds a large static charge. That's why it makes such a good battery, because the lead particles hold a static charge. Well, that static charge also assists the lead in sticking to the skin and other surfaces, lead particles are small, they get trapped in porous surfaces, and lead used to be low cost, so lead sticks to the skin, soluble lead and other soluble metals migrate through the skin, both sweat and saliva are acidic and will dissolve lead. Lead and sweat. The literature reports lead levels in sweat as high as 75mg/L. So in addition to having the lead that I picked up from touching things in the plant, and that settle out of the air onto me, I also am excreting lead when I sweat through the skin pores, and am adding another dose of lead to my skin, which I need to wash off frequently.

So, effective lead removing cleaners. Some soaps are much better than others at removing lead, but the most important thing is to test your worker for lead on their hands. This test kit turns safer direct application to the skin and turns lead yellow, and you can see not only how much is present, but where it is, and it's very good for teaching people that, "Well, you did a good job washing the palms, but you kinda missed the back, you missed the fingernails, and we find that we have to teach people how to wash their hands and how to take a shower. Mom did a pretty good job, but Mom wasn't concerned with them working in a lead plant. Mom was concerned with how, whether or not, how much bacteria they were going to get with their lunch. So we actually find it very necessary to teach the proper way to wash your hands, your arms, your face, your neck, and believe it or not, well, I'm sure you all believe it, there's an awful lot of people in the world who don't know how to wash properly when they take a shower. Observe personal hygiene habits. An individual that has a blood lead, elevated blood lead level, generally has

multiple, things that they do that cause them to ingest extra lead. My favorite is Harry Archer. Harry Archer, oh this is back in the 80s, Harry Archer worked at a lead oxide plant, and he worked in the warehouse, and there was no airborne exposure in the warehouse at all. He was basically loading 30 gal drums of oxide on the trucks, and Harry was the most scrupulously clean individual I think I have ever worked with. When Harry came in, Harry never missed a chance to wash his hands. Harry never touched anything without his gloves. Harry handled his gloves properly. When Harry arrived in the lunchroom, his lunch was sitting there, and he'd come from the washroom where he'd wash his hands, he wouldn't open the door with his hands, he'd open the door with his elbow, he's doing everything right. He'd come in the lunchroom, he grabs a paper towel, he wets it, he wipes off the area where he's going to eat his lunch. Then he gets some more paper towels, and he lays them out, and he sets his lunch bag on top of that, and then he takes the lunch out of his bag, spreads it out on the table in front of him, and then Harry sits down to eat. Well, we finally, after, oh, several days of following Harry around, discovered that Harry had a habit that Harry didn't know he had. Since Harry was a kid, he always wiped his hands before he sat down to eat. He just wiped his hands on his pants, sat down to eat, and we actually had to retrain him to eliminate that lifelong habit.

We find something else when we observe high lead vs. low lead individuals. When high lead people, well, let's talk about the low lead people. Low lead people [inaudible] sitting at their desk [inaudible] with their hands [inaudible] High lead people sit with their hands on their lap [inaudible] We found something very interesting when we looked at the high lead and the low lead people in the plant. High lead people sit with their hands on their laps. So that they actually pick up the lead off their work clothes. They sit this way in the lunch room, they sit this way in the office. Low lead people sit like this, with their forearms resting on their knee, not their hands. High lead people like to sit with their hands in their pockets. They like to play with their change, and I don't know what else, but [laughter from audience], so that's a very simple way to observe high lead people. The other thing is, I've learned over the years that, when I walk through a plant, I can point out the high lead people. So I'll pass along the, the first thing I look at to identify who's got a high blood lead, what I basically do is I look here. High lead people always have lead dust on their stomachs. Almost always. They're picking stuff up, and they're carrying it with their stomach, not just their hands, and generally, their work clothes are not as clean as the low lead people. And that is independent of airborne exposure.

So a few other bad habits that lead to high lead levels. I want the lunchroom and the locker room and the offices spotless. The first thing is, we do not use any porous surfaces in employee break rooms or locker rooms. You'll notice that in this picture of this locker room, I have wood benches. You cannot clean bare wood. We have tried for 20 years to come up with a manner to actually clean bare wood so that it's lead free. We're not holding our breath to solve that, but we do have a simple solution, because it's kind of hard to go through and get money to put for Micah or Melanine on the wood. Varnish works very, very well. It's sealing the lead in, giving you a non-porous surface that you can then clean.

Frequent cleaning schedule. We clean lunchrooms after every break: after morning break, after meal break, after afternoon break, after shift change, so that every time the workers come back into the lunchroom, it has been cleaned since it was last used. Respirator laundry: we see a lot of difficulty in issuing clean respirators. It is very cost effective, time effective, and capital effective to clean respirators in a clothes washer. You can buy, in the U.S., a super capacity clothes washer for $375, and you can wash 40 half mask respirators in 30 minutes in it, or you can wash 15 full face respirators in that same 30 minutes. We put the respirators in a delicate sweater bag, you take off the filters, we generally take off the exhale valve covers also, but that has more to do with making sure that everybody inspects their exhale valves before and after they're washed, and then it is a cleaning requirement, and then we also test respirators coming out on the laundry. We believe that you should issue somebody a respirator that is clean. (How am I doing on time? Oh, I can slow down and tell more stories. If you're interested in actually how that procedure works, it is listed in our catalog how to wash respirators in a clothes washer. Now the long list of rules. Smoking, eating, and drinking in lead process area is out of the question. People who have desks that they return to from the plant are considered contaminated, no eating, drinking, or smoking in offices that are exposed to lead by having lead dust tracked into them from the plant. Eating, smoking, and drinking, only in the lunchroom. In the U.S., smoking has pretty much moved outdoors. Not in the lunchroom any more. Clean, coming off the floor, I'm going to wash up. I wash up before I go back to the office, I wash up

before I go why the plant manager wants to see me, I wash up every time I come off the floor. There is no substitute for frequency in cleaning the skin. Back to proper shower at the end of the shift. Showers have a huge effect on blood leads, but they have the largest effect when people actually use soap in the shower room and spread that soap over their entire skin surface and rinse it off. No consumables in the plant. Cigarettes, chewing tobacco, gum, candy, cosmetics, we don't like wallets, keys, cell phones in the plant either. When we get to the locker room facility drawing, I'll discuss how we deal with those items.

Working dress: we have found it beneficial to wash workers' socks for them so that those socks never leave the plant. We always seem to have, underwear is a real challenging problem, we are, we know we should do something, but we haven't, for the life of us, figured out what we can do that will be acceptable to the people involved. Socks: socks get worn around in the locker room, the locker room is subject to tracked in lead dust, that lead dust on the socks then goes home, then it gets done in the washing machine at the home, and quite frankly, since I only get a 350 mcg daily dose, I need to make sure that I leave all the lead at work, and I don't take any home, so that I actually have 16 hours at home when I can not have any more exposure, and I can spend the time excreting lead. Dust caps. We went back and forth on dust caps for many years in the 80s, well, you get lead on your hand when you handle the cap and take it off, but we've pretty much concluded that we can train around, but we want to keep the hair as clean as we can, because people, you know, like to smooth out their hair. Vacuum cleaning clothes: the OSHA standard requires that you either vacuum clean the clothes or go through a down draft booth which blows the dust off, it's called an air shower. The air shower basically is a clothes booth airlock, they originally were designed for clean rooms, clean room air shower uses air velocities of about 2,000 feet per minute, the, and up to 5,000, what we found with lead is air showers, we need nozzle velocities of 8,000 to 10,000 feet per minute to actually be reasonably effective, and what an air shower will do is it will reduce the amount of dust that's taken into the clean area. It's about 60% efficient, it's going to knock off about 35-40% of the dust, but it'll knock off the loosest dust, the stuff that will come off the most readily in the lunch room, and then about 20-25%, it will embed into the fabric and transfer the problem to the laundry, because now it's more difficult to wash it out of the clothes, because we've embedded it, but we do see actual results on improved cleanliness in the lunchroom where we've used them. Personally, with the level, blood lead levels that we are required by regulation to achieve, I don't think they're a major issue or a good cost benefit, unless you have very, very high dust exposures and dust on the skin, in which case you should be changing your clothes before you go in the lunchroom. The biggest benefit we see is to put in a telephone booth sized air shower where the bag house maintenance crew can clean up before they take their respirators off. That's where we see the biggest, biggest benefit to them, but vacuum cleaning clothes, people put vacuum drops in so people can vacuum their clothes before they go into the lunchroom. Nobody does a very efficient job of vacuuming, or few people do, and even fewer people actually attempt it.

Perspiration. I hate seeing a sweat rag in a back pocket, because it's going to pick up dirt sitting there, take it out and handle it, I'm going to get it dirty, and then I'm going to wipe my forehead and pick up more dust, and I'm going to put it back in my pocket, and it just gets increasingly dirty all day. We believe in single use or one wipe perspiration towels. The exception to that is we do like the sponge bands that you can wear around your forehead. They seem to work pretty well.

Hygiene facilities. I want everybody clean before lunch, I want everybody clean before break, and I especially want them clean before they go home. I don't want them taking it home, lead's not something you really want to share with your children, so take a few minutes and take a stroll through this lunchroom and locker room facility. And enter the plant here, I'm going to put the time clock here, I'm going to go into the clean side of the streetside locker room, and I am going to take off my street clothes. I'm going to pick up my clean work clothes here for the day, and I'll don them here. On this wall, I'm going to put two sided storage lockers. Everybody's going to have an individual storage locker about this big and the depth of the wall, and only, and their combination, because I don't want keys carried into the plant. Everybody has one assigned, everybody has their own unique combination, they can put their wallet, their keys, their lunch, their cigarettes, and their cell phone, and anything else they may wish to use during the day in the break room so they can access it from the lunchroom, and they can access it from the streetside locker room. All righty, so I come in, whoops, there we go, wrong button. Come in, I take off my street clothes, I leave my street shoes in this room, too, I deal with my personal items that putting in the lockers. Now it is generally assumed that the floorway around here, until I get to the plantside locker room where I can pick

up my plant shoes, or my boots, is clean enough, but if I walk in socks, it's never clean enough, so my socks are dirty. The, some plants have resorted to issuing disposable beach flip-flops. Where they lose their street shoes to where they pick up their plant shoes. Others have gone to disposable shoe covers to wear in between. And I like the cost of the disposable shoe covers, and the flip flops are an improvement, but it's not a perfect solution. Maybe one of these days one of you will come up with a creative answer to that problem. So, lose my clean clothes, pick up my plant clothes, pick up my personal protective equipment, although this, generally, the personal protective equipment may be stored elsewhere, I pick up my pants, shoes, and I exit through the washroom out to the plant. Break time, well, let's start in between breaks. I have access to wash facilities and toilets directly from the plant. I have a shoe cleaner so that I keep this relatively clean. I prefer a different layout than this. I prefer the sinks first, then the toilets in the back. Basically, I want to make it easier to wash my hands than to not wash them. So I would move these sinks right smack in front here so that I have to consciously decide, when I come in, I am confronted with the sink. I am confronted with the opportunity to wash my hands, and I have to make a conscious decision to not wash my hands. With this layout, I have to make a conscious decision to wash my hands, because it's not in my path. So I always like sinks right smack in front of me. I don't like them on the wall, I like them right out in the middle, and I want to make that person detour around the sink to avoid washing. Break time. I come in, I can clean my boots, I can deposit overboots, rubber boots that I wear in the wet areas, and then I can pick up my lunchroom shoe covering, here's a work clothes vacuum station, I can also put an air shower in this area, I've got the sinks here, again, I prefer the sinks to be in the person's way, I come back into the lunchroom, I can retrieve personal items from my storage lockers, I can eat, I can retrieve my lunch. Most facilities have an outside door here, or I should say the ones that allow smoking have an outdoor door here to a covered smoking area outside, one of the major issues we see in lunchroom cleaning is that the floors get mopped, the tops of the tables get cleaned, but the chairs don't get cleaned. The edges and bottom of the table, because my knees, which have lead on them, I rub on the bottom of the table, and you'll find very high lead levels there, which people do touch with their hands. The other common thing that we see is we have to clean vending machine buttons. We have to clean microwave buttons. We have to clean the top of the vending machine, because the cup of coffee or the soda comes out, I'm getting four or five, what do I do? I set that first one on top, then the second one, and then when I have all of them, I grab them, but now, the top of the vending machine, which hasn't been cleaned since the day it was installed, and has an eighth inch of dust on it, that dust is going to be moved over to the lunch table. After lunch, I put my stuff back away, I come out, I pick up my work shoes, my personal protective equipment, actually, I've got to use this drawing from OSHA's website, and OSHA kind of assumed that the plant was so clean that I didn't have personal protective equipment, but I'm actually going to provide personal protective equipment storage in that area. I think that would be a good time to break for a few minutes, and I'd like to see if there's any questions on that segment, because lunch and locker room layout and shower room layout is pretty critical. I know what I forgot. A bad time for a break. We didn't finish the shift yet. I only made it halfway through the day. All righty. I come back from work at the end of the day, I'm going to lose my boots, I'm going to come in, I'm going to, I'm sorry, I'm going to lose my dirty clothes, I'm going to be forced to go through the showers, the shower room, I will generally put an inspector or a guard here, because I can't watch the people in the shower room, but I can make sure they come out wet.

I have a story from my childhood for you today. When I was about 8, the age when young boys really, really don't like to take baths and showers, and we were in Michigan visiting Uncle Leo and Aunt Jeanne, and all their kids, and they had seven kids, I was one of five, so twelve kids, what did Mom and Aunt Jeanne do? They hustled us all off to the swimming pool at the high school every afternoon! Well, they had a rule at this swimming pool that you had to take a shower before you could get in the pool. I'm a bright 8-year old or 10-year old, however old I was, so I'd figured out that I'd better get wet when I went through the shower room, because they certainly wouldn't believe I hadn't taken a shower if I wasn't even wet. So I jumped under a shower, I got my hair wet, I got my body wet, and my swimsuits wet, and I went into the line, and the lifeguard's standing at the entrance to the pool, and he's checking if you washed. I walked up, he takes his thumb, and he rubs the inside of my elbow, and he comes up with dead skin cells, back to the shower room! Hey, I learned pretty quick, I washed my elbows with soap, I'm back in line. He rubs behind the ear. Back in the shower room. I go and I wash behind my ears, I'm back in line, he reaches down for the back of my knee. Back to the shower room. I obviously wasn't bright enough at this point in time that there might be someplace else he could check, so I get back in line, and he cleans, rubs

the inside of my ankle, back to the shower room. By this point in time, I'd missed 45 minutes of swim time, but for the rest of vacation, he didn't have to check me again, because he knew I washed. The point of this story is, you can't watch the employees in the shower room, you can watch and see if they come out wet, but that doesn't mean they showered, but you can actually find out if they washed one, two, three, four spots, and actually enforce shower policy, because it's always been a question, how do you enforce people taking showers.

So I've come in, I've lost my shoes, my plant shoes, they don't really address in this drawing how I'm going to get rid of my ordinary plant shoes, but they're going to have to stay in these lockers, and I'm not carrying them through this way, generally, we detour people into lose their shoes, then back around into the shower room. At this point, I don't want anybody going back this way, this is the dirty side locker room, floor's going to be filthy because of the shoe issue, I come into the shower, I come back, I pick up my street clothes, my personal items, I hit the time clock, and I'm on my way. So now, not only have we gone through the whole tour, now is there any questions about lunch and locker room layout? If I take lead home, I extend the amount of time I'm exposed to lead each day, and overbags. Smelter in Port Pirie, South Australia found this was very, very helpful, especially for contractors. Contractors are bringing their tools into work, and people bring lots of stuff into work. At these smelter entrance of the guard shack, any item that is being brought in from offsite is put into these orange overbags, and then while they're on site, they stay in those overbags, and then when they're done, at the end of the shift, the overbags stay at the plant, and then the materials inside have less lead on them when they leave. These are two commercially available shoe cleaning methods. This is a wet boot cleaner, it has nozzles in the bottom, it has side tower nozzles, and it uses high pressure water when you push down on the handle, it's going to clean this surface, and it's going to clean the edges, it won't clean the top, it will keep the pants leg dry, the idea being that, particularly the guys in rubber boots really get their boots dirty, they have a hose they can clean the tops of them, but it's really hard to hose off the bottom of your shoes. This one is a tachyman. It's a permanent variety. You actually need to wash it once a day and regenerate the tacky surface. It will take the surface lead off the soles of the shoes. They're quite popular. The first place they should be considered is the entrance to the nurse's room where they're drawing blood samples, because I don't want to take any more lead into that room than I have to. The other place they're frequently used is in entrances to lunchrooms. They do take maintenance, takes about, well you're going to clean it 10 minutes every shift. So why is lead toxic? Because the body can't tell the difference between lead and calcium. And if lead's present, and the body's trying to do something, and it needs a calcium ion, and it runs into a lead ion first, it'll put the lead ion in that molecule, then it won't work, and that's, at the most basic level, why lead's toxic. Because the body confuses it with calcium. Nutrition matters. Diet has a huge effect on the efficiency of lead absorption. We already mentioned that the lead is absorbed very efficiently on an empty stomach and inefficiently on a full stomach, well, it's 4-10 times the rate. So that 350 mcg, my 100 kilo person can tolerate, that's not actually 350 mcg passing here, that's 350 mcg actually absorbed after its intake. So if I'm on an empty stomach, I can probably ingest 200mcg a day and get away with it. On a full stomach, because the efficiency of absorption is so low, I can probably get away with ingesting 1 ½ mg a day, because the extra lead will never be absorbed. I'm not recommending it, I'm just making the point that a full stomach really matters. Let's see, fibers. Kelp and calcium both happen to have natural chelating agents in them, and there is increasing evidence that will speed removal of lead. Fruits and vegetable fibers go a long way to reducing ingested lead absorption. So eat a good meal before coming to work. High fiber diet reduces absorption in the storage of lead, and a multi-vitamin. Calcium, when you have adequate calcium in your diet, the amount of lead that your body will actually absorb is less. In order to actually efficiently take in calcium and put it to work, you need vitamin D. So calcium with Vitamin D, there is increasing evidence that this is important, dietary supplements for lead workers, all the major nutrient minerals interfere with the absorption of ingested lead, boy we were teaching, we found great success in giving nutrition classes to the workers in the lead plants over the years. So, going to control airborne dust, going to use personal protective equipment, housekeeping, housekeeping, housekeeping, and personal hygiene, personal hygiene, personal hygiene. And thank you much.